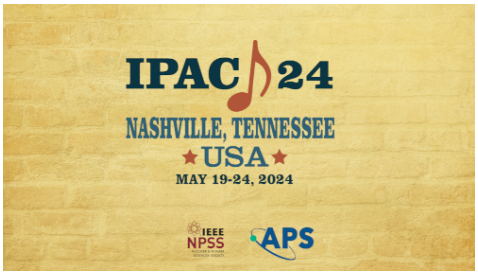

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Precise measurements of mean transverse energy of photocathodes

Wednesday, 22 May 2024 16:00 (2 hours)

Single crystal photocathode films promise to lower the mean transverse energy (MTE) of emitted electrons by tens of millielectronvolts, offering significant benefits for advanced light sources and electron microscopes. Traditional methods for assessing the surface quality involve accelerating electrons in a DC gap and inferring their angular distribution from the beam spot size. However, the accuracy of this approach is limited by the finite spot size of the photon beam at the cathode. To overcome this limitation, we capture a series of electron distributions on a screen at varying accelerating voltages. Each distribution corresponds to a convolution of the electron momentum distribution and the intensity distribution of light at the cathode. The relative contributions of these factors depend on the applied voltage, enabling us to reconstruct both the momentum distribution of electrons and the intensity of light to best match the observations. We conclude that it enables the measurement of the momentum distribution of photoemitted electrons with a resolution of about 5 meV in a reasonable momentatron geometry.

Footnotes

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